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FRIDAY, JULY 19, 1895.

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MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Prof. J. McKeen Cattell, Garrison on Hudson, N. Y.
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DANIEL CADY EATON.

DANIEL CADY EATON, long Professor of Botany in Yale College, died at his home in New Haven, Conn., on Saturday, June 29th. He had been ill for many months, and letters received from him during the past winter and spring show that, while he had become much discouraged about his condition, his devotion to his chosen science was unabated.

He was graduated from Yale College in 1857 and from the Lawrence Scientific School of Harvard College in 1860. He subsequently resided in New York City, where he was intimately associated with Dr. John Torrey. He was elected Professor of Botany at Yale in 1864 and occupied the chair until his death, his services to the University having thus extended over more than thirty years.

Professor Eaton's special field of work was in the taxonomy of ferns, mosses and algæ, and nearly all his published papers relate to these groups of plants, those on ferns being the most numerous, and through them his name is most widely known. The most extensive of these is his 'Ferns of North America,' published in parts during 1879 and 1880, forming two quarto volumes, illustrated by eighty-one plates. He contributed the descriptions of Filices to Dr. Chapman's 'Flora of the Southern United States' in 1860; of the Acrogens to Dr. Gray's 'Manual of Botany,' fifth edition in

1867, and sixth edition in 1890; the treatment of the Compositæ, Filices and Equisetaceæ to Dr. Sereno Watson's 'Botany of King's Expedition' in 1871 and of the Ferns and Higher Cryptogams to the same author's 'Botany of California' in 1880. He was early associated with Dr. W. G. Farlow and Dr. C. L. Anderson in the preparation and distribution of 'Algæ Boreali-Americanæ,' the first consecutively numbered sets of North American algæ of any considerable extent that has been issued. Recently his attention has been specifically given to the Sphagna, and in conjunction with Mr. C. E. Faxon he was preparing sets of these plants for distribution, a most important work, which, it is sincerely hoped, will not be suspended on account of his untimely death.

Personally Professor Eaton was generous to a fault, always most willing to aid his students and correspondents in any way in his power, and beloved by all who were favored by his acquaintance.

N. L. Britton.

THE UNITED STATES GEOLOGICAL SURVEY.

In his monthly report for May, 1895, the manuscript of which has been recently submitted to the Secretary of the Interior, Director Walcott, of the United States Geological Survey, remarks on the early commencement of field work this season as compared with former years, with the prospect of a longer season and more abundant results. The topographic parties nearly all took the field during May, as did also a number of geologic parties. Such topographers and geolgists as were detained in Washington beyond the close of the month have since taken the field from time to time, as the exigencies of the work already in hand permitted. This early commencement of the field work of the Survey is attributable in the main to the action of Congress in providing in the last Sundry Civil bill that the appropriations for the Survey for the fiscal year 1895–1896 should become available before the first of July.

In view of the importance of the Geological Survey as an instrument for the advancement of science and the development of the resources of the country, and the fact that the present report shows to a large extent the work planned for the current year, we give in some detail the different directions in which operations are in progress.

Of the geologists working in New England, Prof. N. S. Shaler was engaged principally in the preparation of his report on the Narragansett Basin, and in investigating, through the aid of Assistant Woodworth, certain morainal belts in Rhode Island. Prof. B. K. Emerson, working also in a New England area, gave two days of each week to field work for the Survey, mapping the geology of the Barre and Marlboro' sheets, of Massachusetts. In his study he was doing microscopic work and making drawings for his report. Prof. T. Nelson Dale reports that such part of the month as he was actually in the employ of the Survey was given to work on the Cambridge, N. Y., sheet.

In the State of New Jersey, Professor J. E. Wolff continued, with the assistance of Mr. Brooks, the survey of the areal geology of the Lake Hopatcong sheet. Dr. W. B. Clark, the other geologist who is working in New Jersey geology, continued the survey of the Bordentown sheet and the contiguous region. This area was taken up late in April. While in Baltimore, Dr. Clark continued his office work upon the Eocene fauna of Maryland and Virginia.

Mr N. H. Darton spent the greater part of the month in the continued preparation of the report on artesian well prospects of of the Atlantic Coastal Plain. Ten days were spent on Long Island, N. Y., for the purpose of obtaining data regarding wells

and to study the geologic conditions affecting underground waters on the Island, and several trips were made to Baltimore with a similar object in view.

In southwestern West Virginia field work was prosecuted nearly all the month by Mr. Mendenhall, Mr. M. R. Campbell's assistant. Mr. Mendenhall was revising the Tazewell sheet. Having completed his office work, Mr. Campbell himself took the field about the 10th, at Alderson, in the same State. From Alderson he and his party worked down New River, studying the conglomerate series as far as Kanawha Falls. From that point they moved to the eastern edge of the Kanawha sheet. Mr. David White was of the Campbell party. He was rendering assistance in the correlation of the different horizons, mainly by the testimony of the plant remains.

Mr. Arthur Keith confined himself to office work, making a preliminary draft of the boundaries of the coal formations on the Briceville and Wartburg sheets of Tennessee, and preparing for field work, which he has since taken up. Mr. C. Willard Hayes took the field the latter part of the month in Alabama and Georgia. Mr. R. T. Hill is engaged in the completion of the Austin sheet of Texas.

Mr. G. K. Gilbert, geologist, spent the first half of the month in the continued prosecution of his work at Niagara Falls, mentioned in the last report. The object of this work was to obtain further knowledge of the details of the history of the Niagara River and the data for the illustration of a report thereon. Completing his task on the 15th, he returned to Washington and was subsequently engaged in the study of the literature of the geology of Niagara Falls and that relating to the associated problems of ice-dammed lakes.

Prof. T. C. Chamberlin, geologist, reports from the University of Chicago that Mr. Leverett continued the preparation of a report upon the glacial geology of the Illinois lobe, making short excursions into the field in connection with that work. Prof. R. D. Salisbury did some work in Pennsylvania and New York, in continuation of surveys made in past years in New Jersey.

The work in the Lake Superior region, under Prof. C. R. Van Hise, was in all respects a continuation of that of the previous month, Dr. Bayley continuing the preparation of the Marquette monograph; Mr. Clements the preparation of the Michigamme monograph, and Mr. Morrow the cartographic work. The head of the party gave his time exclusively to the preparation of the paper for the Sixteenth Annual Report of the Survey.

Office work relating to the geology of the mining districts of Colorado was continued by Mr. Whitman Cross and Mr. G. H. Eldridge, and also, during the last ten days of the month, by Mr. S. F. Emmons. Mr. Emmons and Mr. Spurr were occupied in revising the manuscript of a report on the Murcur mining district.

Mr. Cross was engaged in preparing the report on the geology of the Cripple Creek district, a task which he has, since the close of the month, brought to completion. This paper will appear in the Sixteenth Annual Report. Mr. Eldridge continued the final revision of the Denver report. Messrs. Cross and Eldridge are about to take the field.

During May the maps and descriptive text constituting the Yellowstone Park folio were brought to completion, a number of additions having first been made to the sheets which, Mr. Hague thinks, will greatly enhance their value and interest. The folio is now ready for publication. Mr. Hague is now at work on the monograph on the geology of the Yellowstone Park. Mr. W. H. Weed, geologist, continued office work on the preparation for publication of the Little Belt sheet. On the 25th, un-

der the Director's orders, he made a trip to Boston, to consult with Dr. J. E. Wolff concerning official work. He returned on the 29th and resumed the work above mentioned.

The report on the gold resources of the Southern Appalachians, upon which Dr. G. F. Becker had been engaged all winter and spring, was completed about the 10th of May and placed in the Director's hands for publication. By the 14th Dr. Becker had received and corrected the printed proof of this work, and on the 16th he started, in company with Dr. W. H. Dall and Mr. Purington, for Alaska, to make the investigation touching gold and coal resources, which Congress specially authorized and provided for at its last session. As contemplated in the plans for this work, Dr. Becker will himself make the gold investigations and Dr. Dall those relating to coal. Advices from Dr. Becker, dated June 1st, show that the party had reached Sitka and had actually begun work.

As regards the office work relating to the mining districts of California, it may be stated that Mr. W. Lindgren was occupied with the microscopic study of the specimens collected at Nevada City and Grass Valley, as well as with the preparation of the descriptive text to accompany the sheets representing those districts.

Mr. H. W. Turner left Washington in May. His first work of the season will be the completion of the Bidwell Bar sheet surveyed in part last season in central California. Mr. J. S. Diller spent the last half of the month in the study of geologic material in preparation for his field work this season in Oregon, and in attending to matters connected with the Educational Series of rocks. Under his direction 285 thin or microscopic sections of rocks were made, about 300 specimens were either cut or polished, or both, and 2,150 specimens of the Educational Series were labeled. The work of Mr. T. W. Stanton consisted principally in the revision of a paper on the fauna of the Knoxville beds. This paper was submitted for publication as a bulletin on May 30th, on which date Mr. Stanton left Washington, under orders, for field work in Texas, in accordance with the plans for the ensuing fiscal year. As stated on a previous page, Dr. W. H. Dall was assigned to special work in Alaska.

Prof. L. F. Ward was preparing his paper on some analogies in the Lower Cretaceous of Europe and America, and upon this he was engaged nearly the entire month. He stated under date of June 6 that the task was nearing completion. He gave much attention during the month to work relating to cycadean remains, visiting Baltimore and making photographs of some important specimens for illustrative purposes. Dr. F. H. Knowlton reports that with the exception of three days, which he gave to the study of a small collection of fossil wood from the Isle of Wight and the Island of Portland, England, in connection with Prof. Ward's investigations, his whole time in May was given to the study of the fossil plants of the Yellowstone Park as reported in previous months.

Prof. O. C. Marsh and his assistants continued the work on North American Dinosaurs, attention being directed during the month especially to the illustrations and text for the paper on the subject, designed for the Sixteenth Annual Report.

The field work of the *Division of Hydrography*, under Mr. F. H. Newell, was advanced in a fairly satisfactory manner. The field of operation of this Division is so vast, and the work that is being done in the different sections of the country and on the different streams is so varied in character and affected so much by local conditions, that it is quite difficult to state in general terms and few words the condition of that work at any given date.

Mr. A. P. Davis traveled during the month about three thousand miles. He established river stations at several points in Kansas and New Mexico and, later, went to Colorado, where he made measurements and rated meters. From California, Montana, Idaho, Nevada, Nebraska and other States and Territories come favorable reports of the progress of the work in its several branches. Reports from Washington and Wyoming are not so favorable.

In the east Mr. C. C. Babb spent nearly the whole month on the Potomac, making measurements by which the discharge of the stream can be computed for various heights of water at the different gauging stations.

In the office, the preparation of a bulletin, to be numbered 131, giving the reports of field for the years 1893–'94, was completed. In this bulletin are inserted all the available data concerning the various river stations of the country and miscellaneous information bearing upon the hydrographic work.

In the *Division of Chemistry*, under Professor F. W. Clarke, the number of routine analyses completed and reported during the month of May is 20, Dr. Hildebrand making 6, Dr. Stokes making 5, and Mr. Steiger making 10. In addition to this, some special investigations were under way, and these were well advanced. By Dr. Hillebrand two papers were prepared for journal publication, one on chlorite, from Cripple Creek, Colo., and the other on the estimation of titanium.

The work of the *Division of Mining Statistics*, under Dr. D. T. Day, consisted in preparations for the publication of the report on mineral resources of the United States for 1894. During the month the statistics of production of coal, lead and building stones, were given to the public, through the press, and those on iron ores, tin and the gold resources of the South were in the printer's hands.

In the *Division of Topography* nearly all the parties have been placed in the field and are at work in sections, as follows: Atlantic section, Central section, Pacific section, Indian Territory section. The Indian Territory work is a combined topographic and land subdivisional survey, and was specially authorized by Congress at its last session. Work is in progress in 23 States and Territories.

In the *General Editorial Division*, the following manuscripts were read:—Reconnoissance of Gold Fields of Southern Appalachians: G. F. Becker; for Part II., 16th Ann. Rpt. Production of Iron-ores: J. Birkinbine, Bull. 131. Water Supply Data: F. H. Newell. Text, Knoxville folio: Text, Stevenson folio. Proofs were received from the Public Printer of parts of the 15th and 16th Annual Reports and several Bulletins.

In the *Editorial Division of Geologic Maps* Mr. Willis edited the map of New York State and worked on the Marysville and Smartsville, Cal., and Stevenson, Ala., sheets. Text for the Knoxville, Tenn., Fredericksburg, Va.-Md., and Lassen Peak, Cal., sheets was read in original, and after reference to the authors sent to the press. In the *Editorial Division of Topographic Maps*, under Mr. Marcus Baker, attention was directed largely to the revision and correction of engraved atlas sheets which are about to be printed as the bases for geologic folios.

In the *Engraving Division* the 31 topographic atlas sheets were in course of engraving. Of geologic folios in course of engraving there were 10, and besides, work was continued on the 6-sheet map of New York.

In the printing department 5 geologic folios were in press, viz.: Lassen Peak and Marysville, Cal.; Staunton, Va.; Stevenson, Ala., and Knoxville, Tenn. The Staunton folio was completed. Editions of 11 topographic sheets were delivered from the press.

In the *Division of Illustrations*, under Mr. DeL. W. Gill, 105 original drawings were made during the month, comprising geologic landscapes, maps and sections and miscellaneous subjects. Engraved proofs to the number of 117 were received and examined. In the photograph laboratory 203 negatives and 1165 prints were made.

THE BIOLOGICAL EXPERIMENT STATION OF THE UNIVERSITY OF ILLINOIS.

The State Legislature of Illinois has made a sufficient appropriation to the Biological Experiment Station of the University of that State to provide for it an independent equipment and a separate working force.

This Station was established April 7, 1894, in leased quarters on the Illinois River, at the town of Havana, one hundred miles west of the University. It is devoted to a continuous study of the plant and animal life of the Illinois River and adjacent waters, with principal reference to œcological problems. Its main object is scientific, and the principal business of its staff is original research. Economic ends will be kept in view, and educational applications of the results of its work will be carefully regarded in the preparation of its reports.

The Station is jointly maintained by the University of Illinois and the Illinois State Laboratory of Natural History, each contributing equally to its support. It is under the general management of Professor S. A. Forbes, director of the State Laboratory and professor of zoölogy in the University. Its newly appointed superintendent is Dr. Charles A. Kofoid, its zoölogical assistant is Mr. Adolph Hempel, and its botanical assistant is Mr. B. M. Duggar.

It will be provided with a floating laboratory, 48 x 15 feet, furnished with tables, microscopes and aquatic and other apparatus of observation and experiment sufficient for twenty workman; with rooms on shore for microscope technology and similar work; and with a naphtha launch and several skiffs as means of transportation. Its quarters will be occupied continously throughout the year by its resident force, and will be open to advanced students of aquatic biology during the vacation season of 1896, on terms to be hereafter stated.

Papers are now finished or far advanced setting forth the results of last year's work on rotifers and Protozoa, on oligochaete worms, on Daphniidæ, on insects aquatic in any stage, and on the chemical characters of the waters of the various field stations, as shown by periodical analyses. These papers will be printed separately in the Bulletin of the State Laboratory, and will also be published conjointly, at intervals, together with general discussions and other comprehensive matter, in the biennial reports of the Station.

ALEUT BAIDARKAS IN KAMCHATKA.

There is a statement in Dr. Guillemard's interesting account of the 'Cruise of the Marchesa' (vol. i., pp. 224–227) which, if left uncontradicted, might lead to erroneous conclusions in the discussion now going on as to the relationship and origin of the North American natives.

The 'Marchesa,' in September, 1882, visited a point on the western coast of Kamchatka not far from Cape Lopatka, and there* fell in with a party of 'natives' who came out to the steamer in canoes 'built somewhat on the model of a Greenlander's *Kayack*.' One of these canoes was purchased, and on p. 228 is a figure of the '*Bow of Kurile Canoe*,' presumably the one

*The island protecting the bay 'which is not marked in the chart was named by us after Lieut. R. H. Powell.' Gullem. Cr. Nr., i., p. 225 (1886). It is, however, in the Russian Admiralty charts (for instance No. 1475, corrected to 1880) and is called Tchtashut Isl. The native huts are situated back of Zheltij Mys, which is situated east of the Kurilskoje Lake and the Iljina Volcano (Itterna, Guillemard?).

bought. The Marchesa party also obtained a sea-otter bow and arrow, a figure of the latter being given on p. 225.

On p. 229 Dr. Guillemard says as follows: "We could make out nothing about the nationality of the people of this village. We had been told that some Aleuts from the Bering group had settled in this neighborhood, but it seems that the Kurile islanders have also passed northward, and established themselves on the coast near Cape Lopatka. To us it appeared that they did not differ appreciably from the Kamchatdale type, but the opinion of a mere passer-by on these matters is usually valueless."

Notwithstanding the caution with which Dr. Guillemard has expressed himself, the impression which his account leaves is that the people he met were Kuriles and that the skin-canoe is a Kurile apparatus.

The fact is that these natives were Aleuts pure and simple, former inhabitants of the Aleutian Islands (not even by way of Bering Island, I believe). The history of their location near Cape Lopatka, in Kamchatka, and the consequent appearance of the baidarka, or skin-canoe, on that peninsula is as follows:

The Russian authorities, in order to prosecute the sea-otter hunt in the Kurile Islands at the time when these still belonged to the Russian crown, transferred a number of noted Aleutian sea-otter hunters, with their families, to the Kuriles. At the time of the cession of these islands to Japan it was stipulated that such of the inhabitants as preferred to return to their homes should be allowed to do so. The Aleutian Islands having in the meantime been ceded to the United States, and the Aleuts living in the Kuriles having declared their desire of remaining Russian subjects, they were transferred to Kamchatka at the expense of the Russian government and provisionally located a few miles from Petropaulovski, on the road between this port and Aratcha. Here they lived for several years in extreme poverty and squalor, and, as there was no way of employing them, the government had to feed them to prevent them from starving to death. The ease with which they could obtain *rooka* at Petropaulovski tended to further degrade them and render their total extinction a question of time only, if allowed to continue living in that neighborhood. It having been decided by the authorities to change their habitation, the present site of their village near Cape Lopatka was selected, as it offered a fair prospect of making them self-supporting by hunting and fishing.

These were the natives which Dr. Guillemard and his party met, and thus it came to pass that skin canoes were in use in the Kuriles and in southern Kamchatka.

The illustration of the three-hole baidarka given by Dr. Guillemard on page 226, and the description of a sea-otter bow and arrow, the latter with figure, on page 225, serve as additional proof of the correctness of the above. They are in every detail identical with specimens in the National Museum from Alaska.

LEONHARD STEJNEGER.
U. S. NATIONAL MUSEUM.

THE HISTORY OF NAVIGATION IN SPAIN.

ALTHOUGH Navarrete's *Historia de la Náutica*, published at Madrid in 1846, is now almost half a century old, very little use has been made of it in recent biographies of Columbus. In order to thoroughly understand the greatness of the discovery made by the Genoese navigator, it is essential to be acquainted with the progress of naval science up to his time, and that is what is described in the Spanish scholar's book. He begins by giving a short sketch of seamanship among the Ancients. As a great deal has been done to elucidate the subject

in our time,* a brief summary of the chief results will be sufficient for our purpose.

The Ancients had no means to determine the latitude and still less the longitude at sea, so they navigated wholly by dead reckoning. The instruments at their command were the sounding lead, and at a later time the plane chart. The absence of an instrument to measure the speed of a vessel was not very material—a good estimate of the velocity can be easily obtained without it—but the want of an instrument like our compass, to guide the pilot when thick weather prevailed, was sadly felt. Consequently winter was not considered as a season proper for navigation, and even in summer they generally ranged the coast, seldom venturing into the open sea.

Nevertheless records have been left to us of voyages accomplished by the Ancients, whose daring and perseverance has hardly ever been surpassed. The Phœnicians circumnavigated Africa from east to west some six hundred years before the beginning of our era. The Carthaginian Hannon explored the western coast of Africa. Towards the north, Pytheas of Marseille went as far as Thule, say Shetland Islands. Towards the east the Greek mariner Alexander reached China, and the pilot Hippalos taught his countrymen how to avail themselves of the monsoon for a voyage to India.

The world fell now under the sway of the Romans, one of the most unscientific peoples that ever existed, who left us a sad record of how a nation could reach a high degree of material prosperity, be great in war and in internal administration and remain as unmindful of science as the savage of the Australian wilds. As a redeeming quality may be mentioned the frankness with which the Romans acknowledged the fact. Cicero tells us, for instance, that the Greek geometry had been degraded by them to a simple mensuration. They never became skillful seamen, but land-lubbers as they were, they somehow managed to beat at sea fleets manned by expert sailors, and then very willingly acknowledged the superior seamanship of the adversary. The demand for exotic products, which was very great during the Roman Empire, stimulated to a certain degree navigation considered from a commercial standpoint.

In Spain—about which we are here particularly concerned—the interest in sea-matters, planted there by the Phœnician founders of Cádiz about 1160 B. C., was however kept up. Cartagena and Barcelona were important seaports even in that remote time.

And now a part of the world, including Spain, changed its master again. The followers of Mohammed conquered Egypt, Syria, northern Africa, Persia and the Iberian peninsula. It seemed at first that these rude warriors were going to trample all learning under their feet. But the change came very soon and the wild raiders became a cultured nation. Poetry had already the Bedawin; science was borrowed from more cultured people, the Greeks and the Indians. Not only did the Arabs master the Greek geometry and astronomy and the Indian arithmetic and algebra, but they enriched them with new discoveries. Still greater was their progress in physics and chemistry. It will be sufficient for our purpose to state that they improved the astronomical tables and the astrolabe and borrowed the compass from the Chinese. A certain Bailak from Kisgak tells us:*

"The mariners who navigate the Indian sea are said to use a little hollow iron fish

*See the recent works by Breusing (Nautik der Alten, Bremen 1886, translated into French by M. Vars, Paris 1887) and Torr (Ancient Ships, Cambridge, 1894).

*I borrow the information from Professor Wiedemann's pamphlet: *Ueber die Naturwissenschaften bei den Arabern*, Hamburg, 1890.

which they manage to arrange so that if you put it into a dish of water it floats and points with its head and tail toward the two directions north and south."

So the dead reckoning was put on a firmer basis and the determination of the latitude at sea became possible. It would be very interesting to find the first reference to the compass, known to the Arabs as far back as 854, in the European literature. Navarrete found the following passage in the Spanish Laws compiled in the middle of the thirteenth century:

"And just as the mariners guide themselves in a dark night by means of the needle which is a mediator between the star and the stone and shews them where they go, so," etc., etc.

A well-known passage in Dante (Par. XII., 29) proves that in his time the compass was a familiar object. While the sciences flourished among the Moslems they were sadly neglected in Christian Europe.

Towards the twelfth century, however, a better day dawns in Spain. We see the Kings of Castilla and Leon very solicitous to spread knowledge in their kingdoms. Alfonso VIII., of Castilla, establishes a seat of learning in Palencia. Alfonso IX., of Leon, founds the University of Salamanca, and finally Alfonso the Wise publishes his celebrated tables. In his time flourished the renowned Mallorcan Raimundo de Lulio, who among many other subjects devoted particular attention to seamanship. He gave a geometrical construction to find the ship's place if her preceding place, the course steered and the distance run are known, and improved the astrolabe. As helps to navigation used in his time he mentions the chart, compasses, the needle and the sea star. Soon afterwards the Italians and the Catalans improved the plane chart, Regiomontanus invented a metal astrolabe, and Prince Henrique appeared on the scene as a great promoter of maritime discovery. I shall not stop to give here an account of the careers of the great discoverers of the time, Columbus, Vasco da Gama, Magalhães, but close my review by presenting a short sketch of the great activity in Spain in maritime affairs.

The Spanish Renascence never found a worthy historian, so that I shall simply state that at the beginning of the sixteenth century we find the Spanish mathematicians Ciruelo and Siliceo teaching at the University of Paris, the philosopher Vives at Oxford, while Servet, Harvey's forerunner in the discovery of the circulation of the blood, was burned alive in 1553.

At the same time the Spanish government was very active in promoting seamanship. The office of pilot major and a chair of cosmography and navigation were created, and an official maker of nautical instruments was appointed. The pilots had to pass an examination before a tribunal consisting of the pilot major, the professor of navigation and the maker of instruments, assisted by at least six expert pilots. Inventions tending to facilitate navigation were rewarded.

Thus Diego Ribeiro was awarded in 1532 a pension of 60,000 maravedís* a year for his invention of metal pumps. Before granting this pension, his invention had been submitted to a severe test on an experiment vessel having a commission on board to judge of the advantage gained by using the new pump. A few years later, in 1545, Vicente Barrero, who was the first in Spain to make wooden pumps, obtained an exclusive privilege to construct them for ten years, his pumps having been found much cheaper than those of Ribeiro.

In 1519 Martin Fernandez Enciso published the first Spanish treatise on seamanship, talking as his guide not only the classical writers Ptolemy, Eratosthenes,

*A maravedí was worth about two-thirds of a cent in gold.

Pliny and Strabo, but also the experience which, as he says himself, is the mother of all things.

The next Spanish works on navigation to be mentioned are those of Fernandez* (1520), Faleiro (1535), Medina† (1545), and Cortés‡ (1551), through the numerous translations of which the science of the Spanish pioneers spread all over the civilized world.

Joseph de Perott.
Clark University.

CURRENT NOTES ON ANTHROPOLOGY (XI.).

RACIAL AND ETHNIC TRAITS.

Time was when Nott and Gliddon and their colleagues and disciples undertook to prove the fundamental diversity of the races of mankind, physically and mentally. The pendulum has now swung to the other extreme, and various leading ethnologists deny the existence of any such things as racial or ethnic traits, tendencies or capacities. For instance, Dr. Otto Stoll, in his thoughtful work, 'Suggestion and Hypnotismus' (cap. xx.), calls racial psychology a 'deceptive appearance' (Trugbild); Dr. S. R. Steinmetz, in the introduction to his 'Entwicklung der Strafe,' quotes with approval the opinions of those who say that the only psychical differences in races are those arising from their surroundings, etc.

If such expressions—not always clearly enunciated—mean merely that the traits of races and nations are the slow results of their *milieu*, and are as permanent as the physical results, color, hair, etc., they are truisms which nobody denies; but if, as is apparently the case, they intend to say that at present the Fuegian or the Bantu has the intellectual endowment of the European, and all that he requires to make use of it to as good effect is to be given an equal chance, this is contradicted by uniform and repeated experience. The mental traits of races and peoples are as much their peculiar characteristics as are their bodily idiosyncrasies, and are just as impossible to change by any quick process. The theories of education and government which have been based on the opposite view have steadily failed. The changes in the mental are strictly correlated to those in the physical system. It is vain for ethnologists to seek to forget this elementary physiological fact.

THE PROGRESSIVE DEPOPULATION OF NORTHERN REGIONS.

The last census of Russia showed that its northern province, Archangelsk, had lost over ten thousand of its already sparse population within a decade, not from any general or violent cause, but from the independent migration of families to more genial climes toward the south. Mr. H. C. Bryant and other Arctic travelers assure me that there is no doubt about the advancing extinction of the natives of the extreme north of America and Greenland. Dr. A. Jacoby, in the 'Archiv für Anthropologie' for November last, draws a painful picture of the degeneration and disappearance of the Samoyeds and other boreal tribes of Siberia. Nearly everywhere the arctic and sub-arctic zones have fewer inbabitants than a half century ago.

The general causes are obvious. One is the destruction of the native tribes by the introduction of new modes of life, new diseases, alcohol and idleness; another is the removal of all who can go, to climates of less severity. The arctic regions, like mountains, were not originally chosen by preference as homes, but were the refuges of conquered and dispersed bands. Now that the pressure is removed such inhospitable climes will certainly be occupied less and

* Translated into French.

† The French translation had five editions, the German six, the English one, the Italian two, and the Flemish one.

‡ Translated into English.

less. The center of gravity of the population of the earth tends more and more to fix itself between the isothermals of 40° and 60°; we might even say 45° and 55°. Neither tropic nor sub-artic countries offer the prizes which the masses of the human race now long for.

THE PICTOGRAPHS OF LOWER CALIFORNIA.

AN important article on this subject by M. Leon Diguet in 'L' Anthropologie,' 1895, No. 2, should attract the attention of American archæologists. It gives a list of some thirty engraved or painted designs on rocks in Lower California between lat. 23° and 29°, and presents copies of a number of them, with a satisfying discussion of their character and origin.

The paintings are in red, yellow, black and white, and represent ideograms, persons or animals, these latter at times associated so as to form a group or scene; most of them are on boulders in the vicinity of springs or streams, or else in caves. The petroglyphs are often deeply and clearly cut on the surface of hard rocks, and are of the same general character as the paintings, hence doubtless by the same people.

The first missionaries to the natives of the region observed and noted these curious designs, and inquired of the existing tribes their origin. The reply was that they were the work of a race of giants, who in ancient times came down the coast from the north. This, of course, merely meant that they knew nothing of the designers. The idea of giants arose simply enough from the uncommon stature of some of the persons represented, about seven feet high. It is well known that the tribes who occupied Lower California when it was first explored were extremely rude and devoid of arts.

THE EARLIEST HUMAN OCCUPANTS OF THE ATLANTIC WATERSHED.

A FEW years ago 'advanced' archæologists entertained no doubt about the vast antiquity of the human occupation of the Atlantic watershed. There were 'paleolithic sites' on the Potomac, tools from the Trenton gravels, 'glacial hearths' in New York State, etc.

Matters have changed. The ominous word *talus* robs the Trenton gravels of their fame; 'quarry rejects' explain the paleolithic sites; and so on with one supposed proof and another. Then Mr. H. C. Mercer turns 'the dry light of science' on the darkness of the caves of the Alleghanies, and finds nothing in them older than our familiar friend, the red Indian. Finally, Mr. Gerard Fowke, in a pamphlet just published by the Bureau of Ethnology, gives the results of his archæologic investigations in the valleys of the James and Potomac Rivers, announcing the somewhat startling conclusion that not only did he find no sign whatever of any other occupancy than that of the red Indian, but even this he is convinced could not have been of very long duration, or what could really be called ancient.

Another publication by the Bureau, by Mr. James Mooney, entitled 'The Siouan Tribes of the East,' shows by a large collation of authorities that the Dakota stock at the time of the discovery occupied most of the land east of the mountains, between the Santee River and the Potomac. Mr. Horatio Hale was the first to call definite attention to this unexpected fact.

It is difficult to believe that the splendid forests of the Atlantic slope and its fertile river bottoms remained untrodden by man until our familiar Sioux and Five Nations and Delawares took possession of them, a few centuries before Columbus. Such a supposition involves puzzling anthropologic corollaries; but for the present we must accept it as the actual result of investigation.

D. G. BRINTON.

NOTES ON AGRICULTURE (V.)

NATIVE PLUMS AND RUSSIAN CHERRIES.

Mr. Hedrich, in Bulletin No. 123 of the Michigan Experiment Station, states that our native plums are coming into prominence. They are three weeks earlier than the European sorts, and of the 150 varieties the De Soto, Wild Goose and Miner are the most promising. They are not particular as to soil and desirable 'because of their immunity from diseases and insects.'

The introduction of cherries from Russia dates from 1882. They are recommended for localities too cold for ordinary cherries. The fruit is reddish black in color, late in maturing and with 'a peculiar astringent flavor which is often very pleasant.'

PINEAPPLE CULTURE.

Bulletin No. 27 from the Forida Experiment Station gives, first of all, a full-page plate of a pineapple field in full fruit. Dr. Washburn, the experimenter, has raised the peculiar fruit crop for nine years, and is convinced that it is profitable and that 'pines' can be grown over a large portion of Florida. The plants need to be set eighteen inches apart each way and abundantly supplied with rich food.

THE FLOW OF MAPLE SAP.

It is natural to expect that nearly every subject connected with the production of food supplies will be considered by the Experiment Stations. The one by Mr. Woods of the N. H. Station is upon the flow of sap in maple trees. It is found that the flow of sap is dependent largely upon the depth of the hole, or 'tap,' and the idea that nearly all the sap comes from the outer wood is erroneous, and that sugar makers may profitably tap their trees to a depth of four inches. It was also shown that there is very little gain by tapping a tree in two places; one deep and small hole upon the south side of the tree is sufficient.

DAMPING OFF.

Professor Atkinson, in Bulletin No. 94 of the Cornell Station, reports at length upon a study of microscopic fungi that work upon seedling plants in greenhouses and destroy them by what is commonly known as 'damping off.' This fatal result is occasioned by great moisture content of the soil, high temperatures, close rooms and insufficient light—all of which favor the growth of the low forms of fungi, causing the destruction of the stems of the seedling. The conditions above given should be as far as possible eliminated. As the moulds, etc., enter the plants from the soil it is evident that the latter should be as free as may be of the germs. Diseased plants need to be thrown away and, in serious cases, the soil likewise. The soil may be sterilized by steam heating before the seeds are sown. Those who would have healthy greenhouse plants must be wise as mycologists and as loving as mothers.

Byron D. Halsted.

SCIENTIFIC NOTES AND NEWS.

THE CONGRESS OF PHYSIOLOGISTS.

As we have already stated, the third *International Congress of Physiologists* will be held at Bern, September 9th to 13th, 1895. Prof. Kronecker, director of the physiological laboratory of the University, has kindly expressed his readiness to afford to members of the Congress all facilities for demonstration and experiment, as well as for the exhibition of scientific apparatus. It is especially wished to have a full exhibition of apparatus, which may be contributed either by physiologists or by instrument makers recommended by members of the Congress. Titles of communications from America may be sent to Professor Frederic S. Lee, Secretary, American Physiological Society, Columbia College, New York City. Professor Bowditch has signified his intention to be pres-

ent, and it is hoped that there will be a full attendance of American physiologists, more especially as at the preceding meeting at Liége there was only one representative of the United States. The following are the resolutions adopted at the first International Congress in 1889:

1. An International Congress of Physiologists shall be held triennially, with the object of contributing to the advancement of Physiology by affording physiologists of various nationalities an opportunity of personally bringing forward experiments, and of exchanging and discussing their views together, and of becoming personally acquainted one with another.

2. Membership of the Congress shall be open to all professors and teachers of biological science, belonging to a Medical Faculty or any other similar scientific body, as well as to all scientific men engaged in biological research.

3. The sessions of the Congress shall be devoted to physiological communications and demonstrations. Further communications relating to original research in Anatomy, General Pathology and Pharmacology are acceptable in so far as they present features of general biological interest.

4. It is desirable to keep the communications as far as possible demonstrational and experimental in character.

5. No official report of the work of the Congress shall be published.

The following regulations were discussed and adopted for conducting business at the sessions of the Congress:

1. The languages recognized as official at the Congress are English, French and German.

2. At each sitting two Presidents for the next sitting are chosen by the meeting, on the proposal of the Chairman.

3. At the opening of the Congress the meeting elects for each of the official languages a General Secretary, who shall superintend the preparation of the minutes of the meetings.

4. The minutes are written in the three official languages by three Secretaries chosen at each sitting by the President in the chair. Each person who makes a communication shall sign the protocol of his own communication. The President in the chair shall confirm the correctness of the minutes for the whole sitting.

5. The length of a communication may not exceed fifteen minutes. When that period has been exceeded the President must ask the meeting whether it desires the communication to continue further.

6. A motion backed by three members for the closure of a communication or of a discussion must be immediately put to the vote.

7. The press shall not be officially admitted to the Congress; each member is free to send private communications to scientific journals.

THE YERKES OBSERVATORY.

A PROGRAM recently issued from the University of Chicago gives the following details concerning the site and building of the Yerkes Observatory:

"The Observatory has been located about a mile from the town of William's Bay, at Lake Geneva, Wisconsin, in an ideal rural region, free from the dust and smoke of civilization and removed from the tremors of railroad traffic. Lake Geneva is about 70 miles from Chicago, and is reached by a branch of the Northwestern Railroad. The site of the Observatory includes 50 acres of timbered land, fronting on the Lake, in the midst of one of the most beautiful regions in the country. The buildings will stand on a gently sloping hill, which rises some 200 feet above the water, and as Lake Geneva is 400 feet above Lake Michigan, the Observatory will be approximately 1200 feet above sea level. It is confidently believed that the favorable conditions of the site, and the established steadiness of the atmosphere in this region, will insure the very best seeing."

"The Observatory building will be of the form of a Roman T, with the great dome at the foot of the letter, the small domes for the 16-inch and 12-inch

telescopes being at the other extremities. The main axis of the Observatory, which is some 300 feet in length, will run east and west; in this will be situated the library and the lecture rooms, laboratories for physical, chemical and photographic work, computing rooms, offices of the astronomers, etc. The building will be made of the most durable material and will be substantially fire-proof. The internal furnishing will include the best modern facilities for heating and lighting, so that the Yerkes Observatory, with its powerful and delicate instruments, will constitute an admirable material equiqment for astronomical research."

The mounting of the great telescope by Warner and Swasey, it will be remembered, was exhibited at the Chicago Exposition. All the motions of the instrument are effected by electric motors. Mr. Alvan G. Clark has recently stated that work on the object glass is progressing satisfactorily. The objective is 40 inches in diameter, with a focal length of nearly 64 feet. The largest objective hitherto made by Mr. Clark was that for the Lick Observatory, 36 inches in diameter. Mr. Clark believes that the power of the telescope increases in proportion to the size of the lens and that the limit has not yet been reached.

THE ROYAL ASTRONOMICAL SOCIETY.

According to the *London Times* the last meeting of the present session was held on June 4th, Dr. A. A. Common, president, in the chair. For the first time in the history of the Society, a paper was read before it by a lady, Miss Alice Everett, dealing with the orbit of the double star Iota Leonis. Four photographs presented by American astronomers were shown. The first of these was a representation of 'the old moon in the new moon's arms,' *i. e.*, of the earth-lit portion of the new moon. An exposure of 30 sec. showed very distinctly the chief formations of the part in earth-shine. The second and third photographs were, like the first, by Professor E. E. Barnard, and revealed a most extensive nebula embracing the main portions of the constellation Scorpio. The fourth photograph, by Professor Keeler, showed a portion of the spectrum of Saturn and its rings, and by the different displacements of the lines in different parts of the rings proved that the inner particles of the rings were moving faster than the outer particles—in other words, that the rings are composed of swarms of minute satellites moving in separate orbits, and are not solid, continuous bodies. Professor C. Michie Smith, director of the Madras Observatory, described the work which he had to undertake since the death of the late director, Mr. Pogson—viz., the preparation and publication of some 30 years' arrears of observations. This had now been finished, and only the catalogue waited completion. He also described the new observatory which the Indian Government was building at Kodai Kanal, on the Pulney Hills, at a height of 7,700 feet above sea level. Amongst other papers read during the evening was one by Mr. Lewis on measures made of the diameter of Jupiter and its satellites at the Greenwich Observatory, measures which by their accuracy afforded a gratifying evidence of the efficiency of the great telescope of 28 inches' aperture recently installed there.

GENERAL.

M. Berthelot announced, at the meeting of the Academy of Science of Paris on June 17th, that he had caused argon to enter into combination with the elements of carbon disulphide.

Professor Cope will publish shortly a work in which he will adduce the evidence in favor of the Neo-Lamarckian view that variations of character are the effect of physical causes and that such variations are inherited. He will aim especially to coördinate the facts of evolution with those of systematic biology.

Mr. Arthur Winslow requests us to state that he has for distribution and will

send on application a list of errata intended to accompany his report on the Lead and Zinc Deposits of Missouri.

IN its issue of June 27th, *Nature* reprints from *Insect Life*, in a slightly condensed form, an article on 'Social Insects' by Professor C. V. Riley, delivered as President's address before the Biological Society of Washington. Professor Riley says that insects undoubtedly possess the senses of sight, touch, taste, smell and hearing, but that touch is perhaps the only sense that can be strictly compared with our own. There is also the best of evidence that insects possess other sense organs with which we have none to compare.

THE International Statistical Institute will hold its fifth meeting at Berne from the 26th to the 30th of August next.

AN addition has recently be made to the Arnold Arboretum (Harvard University) of some fifty acres of land, making the whole area now two hundred and twenty-two acres.

ACCORDING to the New York *Evening Post*, Prof. Koebele, of California, whose discovery of the Australian ladybug as a foe of the black scale in California fruit orchards has been of so great value, has found in Japan an insect which he thinks will prove equally fatal to the potato bug.

THE first week of the Summer Congress at Greenacre, on the Piscataqua, was devoted to the Conference of Evolutionists which held its first meeting on July 6th, under the the direction of Dr. Lewis G. Janes, President of the Brooklyn Ethical Association. The program was as follows:

Saturday, July 6th—Evolution Conference, under the direction of Dr. Lewis G. Janes, President of the Ethical Association; 8 P. M., Professor Edward D. Cope, Ph. D., of the University of Pennsylvania, 'The Present Problems of Organic Evolution;' 8 P. M., paper from Herbert Spencer, of London, Eng., 'Social Evolution and Social Duty,' to be followed by a symposium and brief addresses.

Monday, July 8—3 P. M., Mr. Henry Wood, of Boston, Mass., 'Industrial Evolution;' 8 P. M., Mr. Benjamin F. Underwood, Editor *Philosophical Journal*, Chicago, Ill., 'How Evolution Reconciles Opposing Views of Ethics and Philosophy;' letters and brief addresses.

Tuesday, July 9—3 P. M., Professor Edward S. Morse, of the Peabody Institute, Salem, Mass., 'Natural Selection and Crime;' 8 P. M., Dr. Martin L. Holbrook, editor *Journal of Hygiene*, New York, 'Evolution's Hopeful Promise for Human Health.'

Wednesday, July 10—3 P. M., Rev. Edward P. Powell, of Clinton, N. Y., 'Evolution of Individuality;' 8 P. M., Miss Mary Proctor, of New York, 'Other Worlds Than Ours,' with stereopticon Illustrations.

Thursday, July 11—3 P. M., Rev. James T. Bixby, Ph. D., of Yonkers, N. Y., 'Evolution of the God-Idea;' 8 P. M., Dr. Lewis G. Janes, President Brooklyn Ethical Association, 'Evolution of Morals.'

The Congress will be continued during the months of July and August, a lecture being delivered on each afternoon and occasionally one also in the evening. The last lecture will be delivered on August 31st, by Hon. Carroll D. Wright.

PROFESSOR FRASER has obtained, we are informed, definite proof of the antidotal properties of the blood serum of venomous serpents. This result was not unanticipated, as will have been gathered from the statements already published, but its establishment is a matter of great interest, and, perhaps, of some practical importance, since never before, probably, have the bane and the antidote been brought so near together. —*British Medical Journal.*

Two distinct earthquake shocks were felt in Springfield, Mo., on July 8th. The first at 7:30 o'clock and the second a minute later. The duration of the first vibration was five seconds and the second two seconds. No damage was done.

ON July 10th, according to the *Evening Post*, several severe earthquake shocks were experienced in the Caspian and Ural districts of Russia. Many houses were destroyed at Usunada, Astrachan and Erasnovodsk.

At the sixty-first annual meeting of the *Royal Statistical Society* it was announced that the subject of the essays for the Howard Medal with £20 to be awarded in 1896 is 'School Hygiene in its Mental, Moral and Physical Aspects.' The essays should be sent in on or before June 30, 1896.

According to the *Medical Record* the meeting of Bacteriologists, held in New York, June 21st, resulted in the appointment of a committee to consider both the papers presented and the discussion that followed, and to make a report to the American Health Association as to the most desirable methods to be observed to secure the greatest uniformity in the results of the bacteriological examination of water. The members of this committee are: Professoor W. H. Welch, M. D., chairman; Professor W. Sedgwick, Ph. D., Professor Theobald Smith, M. D., Professor T. M. Prudden, M. D., Professor J. G. Adami, M. D., George W. Fuller, S. B., Professor A. C. Abbott, M. D., Professor V. A. Moore, B. A., M. D.

A new Meteorological Observatory has been established on the summit of Mount Wellington in Tasmania.

Sir Edward Maunde Thompson, Principal Librarian of the British Museum, has been elected a corresponding member of the philosophico-historical section of the Berlin Academy of Science.

At the annual meeting of the Numismatic Society of London, Sir John Evans presiding, the silver medal of the Society was awarded to Professor Theodor Mommsen, the veteran historian of ancient Rome, for his distinguished service to the science of Numismatics. Dr. Barclay Head, keeper of coins in the British Museum, received the medal for Professor Mommsen.—*London Times.*

The last meeting of the Royal Meteorological Society for the present session was held on June 19th. Mr. R. H. Curtis, F. R. Met. Soc., read a paper on the 'Hourly Variation of Sunshine at seven stations in the British Isles,' which was based upon the records for the ten years, 1881–90. January and December are the most sunless months of the year. The most prominent feature brought out at all the stations is the rapid increase in the mean hourly amount of sunshine recorded during the first few hours following sunrise and the even more rapid falling off again just before sunset. Mr. H. Harries, F. R. Met. Soc., read a paper on the 'Frequency, Size and Distribution of Hail at Sea.' The author has examined a large number of ships' logs in the meteorological office and finds that hail has been observed in all latitudes as far as ships go north and south of the equator, and that seamen meet with it over wide belts on the polar side of the 35th parallel.

The *Medical Record*, New York, has been enlarged so that each weekly issue now contains 36 pages of reading matter.

Nature states that the Cracow Academy of Science offers prizes of 1000 and 500 florins for the best discussion of theories referring to the physical condition of the earth, and for the advancement of some important point connected with the subject. Memoirs must be sent in before the end of 1898.

UNIVERSITY AND EDUCATIONAL NEWS.

ANTHROPOLOGY IN HARVARD UNIVERSITY.

The Department of American Archæology and Ethnology in Harvard University, under the direction of Professor F. W. Putnam assisted by Dr. G. A. Dorsey, has just issued its announcement for 1895–96. The first course in general anthropology is intended to give students a general knowledge of the subject and to be preparatory to advanced work in physical anthropology, ethnology, sociology and history. The first

part of this course will be devoted to the study of somatology or physical anthropology; the second part to ethnology, with special reference to the origin and development of primitive arts and culture; and and the third part to archæology and ethnography, in which man will be considered in relation to his distribution over the earth from geologic to the present time, and his division into groups. Each group or variety of man will be studied separately, special attention being given to American groups. These subjects will all be studied with the aid of work in the laboratory and museum. A second course is announced, entitled *Research Course*, which will be conducted under the immediate supervision of Professor Putnam and will require three years for its completion. This course will be carried on by work in the laboratory and museum, lectures, field work and explorations, and in the third year by some special research.

This course is in the first place intended for graduate students who are candidates for the degree of Ph. D., but it is also open to students who have taken Course I., or its equivalent, and who may be competent to undertake it.

The facilities at Harvard University for the study of anthropology are particularly favorable. The collections of American archæology in the Museum are unsurpassed. The osteological collection contains over 3000 human crania and several hundred skeletons for the comparative study of the different races. In addition to the large library of the University, the library of the Peabody Museum contains 1400 volumes and 1700 pamphlets, covering the whole field of anthropology, and includes the principal anthropological journals, proceedings and reports of societies of the United States and of Europe.

In addition to the scholarships annually awarded on the nomination of the Faculty of Arts and Sciences, there are three scholarships which are awarded only to students in anthropology. The Hemenway Fellowship of $500, to be held by a student of Harvard University pursuing the study of American archæology and ethnology, is awarded annually by the Trustees of the Peabody Museum to a student in the Graduate School. The Than Fellowship (the annual income of which is $1050), for work and research relating to the Indian race of America, or other ethnological and archæological investigations, is now payable, under certain conditions, by the terms of the gift, to a special student in connection with the Peabody Museum, nominated by the founder. And the Winthrop Scholarship, to be held by a student of American archæology and ethnology, is awarded annually by the corporation. The annual value of this scholarship will probably be $200.

UNION COLLEGE.

THE recent centennial celebration of Union College calls attention to the fact that it was the first American college that was not founded under the auspices of a special religious denomination. It is said also to have been the first college to make scientific courses and modern languages parts of its curriculum. In the course of the exercises of the centennial celebration addresses were made by representatives of the Episcopal, Dutch Reformed, Methodist, Baptist, Presbyterian and Roman Catholic Churches, and greetings were received from representatives of the faculties of Harvard, Yale, Columbia, Johns Hopkins, Brown, Amherst, Williams, Dartmouth, Bowdoin, Washington and Lee, Rutgers, Hamilton and Vassar. Among the speakers were Bishops Doane and Potter and Presidents Gilman, Hall, Scott, General Andrews and Taylor.

GOVERNOR HASTINGS has signed the bills passed by the Legislature of the State of Pennsylvania appropriating $200,000 to the

University of Pennsylvania, $212,000 to the Pennsylvania State College and $112,000 to Jefferson Medical College. Large sums are also appropriated to some forty different hospitals throughout the State.

The Rev. O. C. S. Wallace has accepted the chancellorship of McMaster University.

Dr. J. L. Goodnight has been appointed president of the West Virginia University, and Dr. P. R. Reynolds vice-president.

The program of the department of astronomy in the University of Chicago announces among its officers of instruction S. W. Burnham, professor of practical astronomy, and E. E. Barnard, professor of astronomy, but the courses during 1895 will be given by Professor George E. Hale, Dr. T. J. J. Lee and Dr. Kurt Laves.

Professor Robert Adamson, now of the University of Aberdeen, has been appointed professor of logic in the University of Glasgow.

Mr. W. T. A. Emtage, professor of mathematics and physics at University College, Nottingham, has been appointed principal of the Wandsworth Technical Institute.

The regents of the University of California have built two brick dwellings on the summit of Mt. Hamilton for the use of the astronomers of Lick Observatory.

Steps are being taken for the foundation of a Jewish University at Jerusalem.

CORRESPONDENCE.

AN INTERNATIONAL CONGRESS OF BIBLIOGRAPHY.

To the Editor of Science: I have followed with great interest the discussion in Science about the proposed general index of scientific literature, the more so, as this subject has engaged my own speculations for some time past. Three or four years ago, while still in Sweden, I tried to interest librarians and literary men in the founding of a Bibliographic Society, one of the aims of which should be to maintain a bibliographic bureau much of the same kind as foreshadowed by some of your correspondents. And last year I read before the *New York Library Club* a paper on 'International Subject Bibliographies,' afterwards printed in *The Library Journal*, July, 1894. The points there specially emphasized were:

1. That the big, monumental bibliographies are things of the past, the need of our days being shorter lists of the available literature in the several sciences and branches of sciences.

2. That such bibliographies should be international.

3. That the work should be carried on from some central bureau, established in connection with some great general library, and which could serve the double purpose, besides this one, of being an information bureau for scientific literature, and a training school for bibliographers. Of such bureaus there could be established several, *e. g.*, one for natural and physical sciences; one for history, geography and archæology; one for anthropology, social and political sciences, etc., and of course there would be needed one set of bureaus here in America, and one or several in Europe.

4. That the work should be in charge of some international congress, as I looked at it then, a Congress of Librarians.

I wish to emphasize right here, as has been done by the Harvard University Committee, that the word *science* should be taken in its very broadest aspect, no subject that can be treated in a systematic and scientific way to be from the outset excluded.

I will not enlarge now on the question of card index *vs.* book index, or on the several other details that have come up in the discussion, as I consider these to be of secondary importance to the questions: Shall anything whatever be done in the matter? And by whom?

If the first of these two questions is answered in the affirmative, the working body created and necessary means secured, then the details of the plan can safely be left for that body.

The *Royal Society* gave as the date, when the work ought to be in shape to begin, the year 1900; and I think that year is none too far away, as the necessary preparations, as a matter of course, will take some years.

It was proposed, and specially by Mr. G. Brown Goode, in his very full and suggestive article, that an *International Congress of Science* be organized, something of the same character as the American and British *Associations for the Advancement of Science*. I agree fully with this proposal of an international congress. But I would make its scope more narrow and to the point, an *International Congress of Bibliography*. And to prepare for this, I would suggest that there be started right here an organization committee to consult with interested bodies and persons both in America and in the European countries. Will the Editor of SCIENCE take this matter in his hands and call such a committee?

AKSEL G. S. JOSEPHSON.

LENOX LIBRARY, NEW YORK.

A CARD CATALOGUE OF SCIENTIFIC LITERATURE.

THE valuable papers that have appeared in SCIENCE on the practicability of a card catalogue of scientific literature have awakened a deep interest in the subject among those who feel how desirable a work of this kind would be to each individual worker in the field of science. Already an immense amount of scientific literature has accumulated which needs to be brought together in such a manner as to be readily accessible to the investigator, and, when we consider the rate at which it is increasing, the necessity for adopting and putting into operation some plan by which the users of scientific literature may be able to find all that has been written upon a given subject pertaining to science becomes strikingly apparent.

The writer has been engaged in preparing a bibliography and index of certain subjects for several months past, and the desire that the results and such tentative deductions as may be drawn from them may be added to our knowledge of the actual possibilities of a catalogue of scientific literature, and that other workers in this line may be induced to give us their experience, represents the object of this communication. The work just referred to was begun without previous training in this special line and with somewhat indefinite ideas as to what might be accomplished in the time that could be devoted to it. The opinions that have been formed during its progress, in their bearing on the present discussion, will first be stated before describing in some detail the scope and character of the work that is now being carried on.

1. The card catalogue, it has been said, has its limitations. This must be evident to every one when it is considered that such a catalogue as has been recommended to the Royal Society by the Harvard University Committee will extend over a series of years and must inevitably become bulky and unwieldy even when applied to but a single branch of science. Then, too, something more than a bibliography is becoming necessary. This is readily seen when one considers the time and labor expended in frequently running through a long list of titles of papers in order to find what has been written on a given subject.

2. Such a work should be published in book form after the close of each year and contain a bibliographic catalogue and a subject index. It is unnecessary that the indexing should be carried to the extreme, but simply to gather together under each special division of every branch of science

those papers which bear on that particular subject. It has been urged that none but the expert or specialist should undertake subject indexing. It is desirable that the scope and arrangement of the subject index of each branch of science should be determined by specialists in that particular branch. But, since it is not possible nor even desirable to go to the extreme in indexing, it seems quite probable that a general subject index of all the principal subdivisions of each branch of science can be accurately arranged on a previously determined plan, by one who has only a general knowledge of the principles on which each of the branches upon which he is working is based.

3. International coöperation in the past has not been of such a character as to fill one with confidence that it would successfully manage a work of such magnitude. The scope and plan of the work should be determined by an international committee, but the responsibility for the accuracy and prompt publication of the matter should be as limited as possible. An international committee might be selected to determine the scope and arrangement of the work, the language or languages in which it is to be printed, the person or persons who are to be in charge of its preparation and responsible for its accuracy and completeness, and to adopt a plan for raising the necessary funds. One person might be selected from each of the several European countries and from the United States to prepare a bibliography and index, on this predetermined plan, of all scientific literature published in their own country during each year; this manuscript to be forwarded to the central office and there examined and arranged in final form, and each person to receive compensation and credit for the individual work performed. To carry out such a plan involves a great amount of careful, painstaking and laborious work, and its success would largely depend on the proper selection of individual workers, and on the coöperation with them of the scientific world in general.

4. It seems quite necessary that a concise synopsis of the contents of each paper should be made and form a part of the bibliography. This should be printed in the language in which the paper is written, and should be translated into English or French or both. This adds greatly to the work of preparation, but it is the only way to make it of practical use to the hundreds, possibly thousands, who would use such a work.

5. It should not only be published as a whole, but should be so prepared as to be separated into different parts to be distributed as separates for the use of those who do not care to subscribe for the whole work. By determining the arrangement of the index before beginning the perusal of the literature, on one side of the catalogue card could be written the entry for the bibliography, and on the reverse side the subdivisions of the index under which the paper properly belongs. Copies of these cards could be made, and from these a bibliography and index of any branch or a number of branches of science could be published separately with a minimum amount of labor and expense.

The work which has been heretofore referred to as being carried on by the writer comprises a bibliography and index of North American geology, paleontology, petrology and mineralogy and is to be published as a bulletin of the United States Geological Survey. It is intended as a continuation of the previous publications of the Survey of the Record of North American Geology, but the scope of the work and its arrangement have been materially changed. The first number contains a record of papers published during 1892 and 1893 and is now in press. The work for the year 1894, it is expected, will be distributed before the close of the present year, and the manuscript for

1895 will be ready for the printer shortly after its close.

It is divided into two parts: a bibliography and an index. The bibliography is arranged alphabetically by authors' names and contains the titles of each paper, place of publication, references to abstracts and reviews, and a brief summary of the contents. The entries are numbered from 1 to something over 1100 and are used for index reference. The index of the four subjects is published as a whole and is arranged alphabetically. Its geographic arrangement is by States and Territories of the United States and the other political divisions of North America. The geologic subdivisions are those of the different geologic periods and dynamic, economic, glacial and physiographic geology. The papers relating to economic geology are arranged by condensed titles of papers under the different geographic subdivisions which they describe, and there is also given a list of the useful minerals and ores described. Under mineralogy is given the condensed titles of papers and a list of minerals described. Petrology is divided geographically by the States and countries in which the rocks described occur and by a list of rocks described. Paleontology is subdivided by the different geologic periods and a list of genera and species described. In each of the lists of ores, minerals, rocks and genera and species the paper in which they are described is referred to by author's name and number of the entry in the bibliography. These represent the main features of the index.

In making up the bibliography the library catalogue card is used (size $4\frac{1}{2}$x$6\frac{1}{2}$ inches). On one side is written the entry that appears in the bibliography, and on the other the subdivisions of the index under which the paper is to be listed. In this manner all the information in regard to each paper is assembled on one card. Thus the indexing can be determined on while the paper is still in hand, and, as soon as the bibliography is complete, the task of making up the index can be easily and rapidly accomplished.

The following specimen card illustrates the plan:

FACE OF CARD.

HILL (Robert T.), Geology of parts of Texas, Indian Territory and Arkansas adjacent to the Red River. Geol. Soc. Am., Bull., vol. 5, pp. 297–338, pls. 12–13, figs. 1–4.

Describes the physiography of the region. Gives a list of the Cretaceous, Tertiary and Pleistocene formations and their subdivisions, whose outcrops at different localities are described. Gives lists of fossils found at certain horizons, discusses the oscillations of land and sea, and includes the author's conclusions as to the Cretaceous section of the region. Plate 12 contains a geologic map and cross sections.

BACK OF CARD.

Texas, Arkansas, Indian Territory, Cretaceous, Eocene, Pleistocene, Paleontology (Cretaceous), Physiographic geology.

The work has been conducted along with other office work, and hence only an approximation as to the length of time required to complete a year's bibliography of this kind can be made. It is believed that from four to five months' time of one person will be required to examine the literature, prepare the manuscript and read the proof. With skilled clerical assistance much more could be accomplished in the same time.

F. B. WEEKS.
U. S. GEOLOGICAL SURVEY.

VOLCANIC DUST.

SEVERAL notices of volcanic dust have appeared recently in SCIENCE. It may be interesting, perhaps, to some of the readers of SCIENCE to learn that a large deposit of of volcanic dust occurs in central Kansas, in McPherson Co., just north of the watershed between the Smoky Hill and Little Arkansas, and in the great depression extending from Salina to the Little Arkansas.

The deposit has been noted by J. A. Udden, in the *American Geologist*, June, 1891.

I have examined the deposit at various points of exposure, the extreme points being about fifteen miles apart. The deposit where noted is from two to four feet in thickness. It rests on a bed of clay and is overlaid by a bed of yellow marl. The altitude of the exposures varies perhaps forty or fifty feet. At the lowest point the dust is well assorted and stratified; at the higher points it shows signs of having been deposited in shallow water.

During the past winter I had Mr. Jas. Gilbert, a candidate for a higher degree at the Kansas State University, and former pupil of mine, make an analysis of some samples of the volcanic dust. The following is the result:

SiO_2 and insoluble residue	92.32—
Fe_2O_3, Al_2O_3	2.66—
CaO	.60—
Mg O	2.88—
H_2O	1.22—

Traces of P, CO_2, Cl, Na, K.

Under the microscope it is found to consist almost wholly of microscopic, transparent, silicious flakes of various irregular forms. The most common forms being curved and nearly triangular. How did so large a deposit of volcanic dust reach central Kansas?

H. J. Harnly.

McPherson, Kansas.

SCIENTIFIC LITERATURE.

Zur Psychologie des Schreibens mit besonderer Rücksicht auf individuelle Verschiedenheiten der Handschriften. Von W. Preyer. Mit mehr als 200 Schriftproben im Text nebst 8 Diagrammen und 9 Tafeln. Hamburg und Leipzig, Leopold Voss. 1895. 230 pp. with index.

The writer of the following lines approached the object of reviewing this book with German seriousness and with a determination to do justice. It is not always easy to do justice to a German book written with a serious purpose, because one is invariably entangled in a maze of details from which it is impossible to be free without incurring the reproval of neglecting some part of the argument. Yet the details are multiplied, like the testimony in the Roger Tichborne case, until one is simply drowned in them without being convinced of their relevancy. These remarks apply rather to those cases where German perseverance and German accuracy are enlisted in trancendental or speculative philosophy than to the discussions of exact science, where these Teutonic virtues evolve models of correct procedure. German 'Genauigkeit' applied to chimeras is like the application of the Lick telescope to the determination of the longitude of a cloud, or the application of the fine grinding mill, to which Huxley compared mathematics, to the reduction of worthless material. His apothegm, it will be remembered, was that however perfect the treatment, the value of what you got out depended upon the value of what you put in. Let us examine the book before us more attentively.

The work consists of 223 pages of text divided into five chapters and an appendix of three pages (of which more presently) on the relations of Goethe, Lavater and graphology reciprocally.

The subjects treated are as follows:

Chapter I. Wherein do handwritings differ from each other?

Chapter II. How do differences of handwriting arise?

Chapter III. Analysis and synthesis of handwriting.

Chapter IV. The significance of individual characteristics of writing.

Chapter V. Concerning the pathology of writing.

Appendix. The beginnings of graphology with Goethe and Lavater.

Alphabetical Index. Six pages.

Nine tables.

Besides these there is an introduction of four pages not enumerated. In this we became acquainted with 'Prof. Dr. W. Preyer,' written in three different styles, which we are asked to accept as typical English, French and Italian hands. We cannot do so. There are certain peculiarities of each writer manifest, but whether one considers each letter separately, or 'all together,' it is more than doubtful if a conscientious expert could assign the nationality of each writer without further help than the writing only. This national character, we are told, changes with the centuries. Another set of examples are given to show that the commercial differs from the scholarly handwriting. Again we acknowledge the differences between the specimens, but are compelled to reject the conclusions as to class, always conceding, however, that the specimen he calls typical is perfectly consistent with the popular idea of the character of the class in which he puts it.

Thus early in the book it begins to appear that our German author is committing the un-German fault of reaching conclusions through a defective second premise. This fault is the keynote to the entire treatise and it seems to us the keystone of the entire structure which Herr Preyer has built. In the first chapter he has richly illustrated platitudes such as 'the differences which belong to the standpoint of the observer,' 'Writings may be distinct and strong yet legible, etc.' In some cases the classification seems puerile; as, for instance, when it is proposed to count in 100 words how many curves occur where angles should be and *vice versa*, and to consider the percentage of both kinds of faults as an element of judging of the psychological condition of the writer (Chap. I., p. 8), or where it is proposed to draw the radii of a circle on a sheet of glass ('or transparent paper, where great accuracy (!) is not necessary') in order to measure the slopes of letters (Chap. III., p. 47+). It would seem from this last ingenuous remark that the common horn protractor was unknown to Herr Preyer. He divides Chapter IV. into: (1) this form of the writers' characters; (2) the junction of the letters with each other; (3) the completeness of the copy (*i. e.*, the absence of gaps where letters, words or their abbreviations should be); (4) the size of characters; (6) the direction of the component character of the writing; (7) the direction of the lines; (8) the length of the lines; (9) the distance apart of the letters, words and lines; (10) the flourish under the name.

This chapter takes up 149 pages, or much more than half the book, which latter may be considered to have been constructed around it, as the Atlanta has been said by her constructor, Charles Cramp, to be a hull constructed around a pair of boilers.

The last chapter on the Pathology of Handwriting is rather on the indications of the moods of the writer, and has the fault of the rest of the book, superficiality.

But, as if it were not possible for a German in earnest (as Herr Preyer evidently is) to completely belie the system and scrupulousness which have made the German scientific literature absolutely indispensable to any worker, he displays his faults of method completely in his appendix. The questions here are: Did Goethe believe in graphology? Did he invent it and suggest it to Lavater or not?

Out of a large mass of erudite citations showing commendable industry and intelligence, the reader who strips the verbiage from the idea conveyed discovers that there is not a scintilla of proof that Goethe ever seriously maintained that one's character could be discovered by his handwriting. Suphan thinks that Goethe probably was

much interested in the expression (*i. e.*, the formation) of the hand in Lavater's 'Physionomische Fragmente.' In a mass of literature Herr Preyer fails to find either what would affirm or deny that Goethe had originally conceived the idea and written to Lavater of it. After all, he thinks Goethe might have imparted this orally to Lavater, and he still clings to the belief that the tradition is true which ascribes to Goethe the belief that actually men could be judged by their handwriting.

This lame and nonsequitur logic is unfortunately applied throughout the book, and mars its value to an earnest student, in spite of the exceedingly good and faithfully executed illustrations. In fact, these latter not infrequently produce the effect on the reader which a series of splendid stereopticon views of Paris would exercise on an audience listening to a lecture on chiromancy.

Professor Preyer's treatment of his subject is infinitely more serious and heavy, but not nearly as amusing and plausible as that of Don Felix de Salamanca (Chatto & Windus, Piccadilly, London, 1879, The Mayfair Library) in 'The Philosophy of Handwriting,' or, in other words, graphology. (Don Felix, for some reason, insists on calling this chiromancy, which is generally understood to be palmistry.) It is probable that Preyer was familiar with this work from the similarity of expressions which occur in the two, thus Don Felix says (p. 7): "A strong resemblance is oftimes discernible between the handwritings of various members of a family," etc. Preyer says: "Dasselbe gilt von der Aehnlichkeit der Eltern und Kinder, der Geschwister untereinander. Ein Familientypus der Schrift, wie ein solcher des Ganges oder der Mimik und Sprechweise tritt, oft deutlich zu Tage" (p. 3). Salamanca observes: "Indeed, it is not overstraining the limits of this theme to assert that not only are the idiosyncrasies of individual scribes proclaimed by their penmanship, but even the peculiarities of whole nations" (p. 7). Preyer puts it: "Denn so wie es Nationalphysiognomien, Nationaltrachten, nationale Geberden geibt, giebt es auch Nationalhandschriften" (Einleitung, p. 1).

In spite of the fact that the earlier author betrays (quite unconsciously) as thorough a knowledge of the bibliography of the subject, and maintains equally with his German follower a belief in his ability to reach some traits of a man's character through his handwriting, yet he does not push this airy fancy to the extreme limits of absurdity by pretending it can take the place of the ordinary and slower methods of observation and experience.

To sum up Professor Preyer's claims to merit in his book: He has industry, accurate illustrations and truthfulness in statement to his credit; but on the other side of the ledger are lack of logical method, discursiveness, and predominance of the unscientific imagination.

There is some truth in his main contention, *i. e.*, that a handwriting is influenced by the character of its author. It is equally true that the appearance of the creases and worn parts of a pair of old shoes is also indicative of the character of the wearer; but neither is able, in this matter-of-fact world of ours, apart from the dream land of Sherlock Holmes et id omne genus, to give a truth-loving student the means of attaining to more than the vaguest knowledge of the character of the individual to whom it owes its existence.

It is unfortunate at this time, when an honest effort is being made to extract from handwriting certain legitimate information of value to the courts of law, that these fanciful productions should appear, with the result of confusing the layman as to their respective objects very much as astrology and astronomy were once confounded by laymen of yore.

Persifor Frazer.

The Natural History of Aquatic Insects. By PROFESSOR L. C. MIALL, F. R. S., with illustrations by A. R. HAMMOND, F. L. S. London, Macmillan. 1895. 8°.

Professor Miall has given us an excellent book. He has passed in review the life histories and particularly the larval life of most of the commoner and many of the rarer forms of aquatic insects of Great Britain, and supplemented his own story of their structure, contrivances and mode of life by liberal extracts from the renowned but too neglected works of Réaumur, Lyonnet, DeGeer and Swammerdam, reviving a genuine interest in their virgin discoveries, often since repeated. He has brought to bear upon his study the equipment of a naturalist well trained in all the modern appliances for investigation, and has thereby been able to explain better than has been done before the operation of the varied mechanisms by which insects properly and originally terrestrial (as he insists) have become fitted for a more or less prolonged subaqueous life.

The work is written in a very simple and clear style, which he seems to have caught, as it were, from the older and now classical writers upon these topics. By the aid of the excellent and abundant illustrations, the most abstruse parts (if there may be said to be any such) are made comprehensible to any bright boy's intelligence, and will make him wish to set up an aquarium forthwith.

There is the meagrest possible reference to American insects, and the way is therefore open to one of our own entomologists to follow Mr. Miall's example and give us something of personal study in the same ample field, supplemented by the scattered accounts that already exist; unless, however, he follows our author's example and familiarizes himself at first hand with a large number of varied forms, he will produce but an indifferent work. Meanwhile the present volume will admirably serve as a guide to any young entomologist, for it deals with forms almost all of which have their close counterpart in the life of our ponds and streams.

The book is excellently printed; in reading it through we have noticed but a single typographical error, where (p. 347) Heteroptera is printed Heteropoda.

S. H. S.

The Butterflies and Moths of Teneriffe. MRS HOLT WHITE. London, L. Reeve & Co. 1894. pp. 9 + 107, 4 colored plates.

Mrs. Holt White, a connection by marriage of Gilbert White, of Selborne, spent the winter of 1892–93 in Teneriffe, and has published the result of her observations on the lepidopterous fauna of the island in a popular and unpretending volume.

The introductory chapter sketching briefly the characters and life histories of the Lepidoptera, though the least satisfactory part of the book, is not likely to mislead, and may readily be improved in a future edition, which will surely be called for; the hints and suggestions, and the directions for the killing, setting and relaxing of specimens are generally good, though here the main point to be gained is always experience.

Twenty-nine butterflies and thirty-four moths are briefly characterized, and there are frequent notes on their comparative abundance, habits, early stages and food-plants. In addition to the above, there is a list of twenty-eight moths, most of them recorded on the authority of Alphéraky in his paper, 'Zur Lepidopteren-Fauna von Teneriffa,' in the fifth volume of Romanoff's magnificent Mémoires sur les Lépidoptères; these, principally microlepidoptera, are considered by Mrs. Holt White as of little interest to the ordinary collector.

The four plates give good, recognizable figures of twenty butterflies and eleven moths; the coloring, though in some cases somewhat rough, is always effective.

The object of the book, to give an account of the Lepidoptera of Teneriffe which will enable students to identify their specimens, is certainly accomplished. Another edition should be enlarged to include brief descriptions and, if possible, figures of all the moths known to occur in Teneriffe. The systematic arrangement of the moths in the text should also be revised to correspond with that of the list.

Samuel Henshaw.

A Treatise on the Morphology of Crystals. By N. Story-Maskelyne, M. A., F. R. S., Professor of Mineralogy, Oxford. Octavo xii.+521. New York, Macmillan & Co. 1895. $3.50.

Although the constancy of angle between like planes of crystals furnishes the basis for a purely mathematical treatment, students in mineralogy, chemistry and petrology, to whom some knowledge of crystallography is essential, have rarely had the high mathematical training essential to the understanding of works like those of Liebisch, Mallard or Klein, and they will appreciate this treatise of the veteran Oxford professor, in which the principles and problems of crystallography are designedly treated in the 'simplest form compatible with strict geometrical methods.'

The work deals solely with the morphology of crystals, and is to be followed by a volume treating, in a similar manner, the physical problems necessary to a thorough knowledge of crystallography. After a brief statement of the general properties of crystals, especially the physical characters, the author proceeds to the logical development of his subject. The expressions for the position of a plane and of an origin-edge or zone axis are first deduced and the principles of stereographic projection clearly and simply stated. The practical application of the stereographic projection is then made possible by the solving of certain problems, such as: 'Given the projection of a great circle, to find that of its pole;' 'To determine the magnitude of an arc of a great circle from the projection of that arc;' 'To draw the projection of a great circle in which two points are given,' etc.

The properties of zones, the relation connecting tautozonal planes and the relations between edges and normals are examined, and the necessary expressions deduced by purely geometrical methods and also by the methods of analytical geometry. Preliminary to a discussion of symmetry, it is clearly brought out that the only angles possible between consecutive normals in isogonal zones are 90°, 60°, 45° and 30°.

Chapter IV. deduces expressions for changing parametal planes and axes, and proves that axes are not arbitrary diametral lines but are necessarily origin edges or face normals.

The possible varieties of symmetry, holo and mero, and composite and twin crystals, are elaborately treated. The author's wording of the law of symmetry or second fundamental law of crystallography is new and very thorough. "On a crystal the extant or absent features of a form must be extant or absent in the same way in respect to equivalent systematic* planes." The six systems are separately considered each under the headings: holosymmetrical forms, hemisymmetrical forms, combinations of forms, and twinned forms. The balance of the book is taken up with methods of measurement, calculation and representation.

The work is clearly printed and the diagrams are well conceived. The mathematical deductions can usually be followed by any one with a working knowledge of geometry and analytical geometry. The statements and definitions are very exact but not always concise. For instance, the definitions of a crystalloid system of planes

*Planes of symmetry.

is one sentence of eighty-five words (p. 23). There is no doubt that the work is in every way one of great value to students.

A. J. MOSES.

SCIENTIFIC JOURNALS.

THE ASTROPHYSICAL JOURNAL, JUNE.

The Measurement of Some Standard Wave-Length in the Infra-red Spectra of the Elements: EXUM PERCIVAL LEWIS.

In a review of the previous work in this field, the writer shows that very little has been done toward the identification and accurate measurement of lines due to the elements in the infra-red, and that the means employed have been comparatively crude. In the present investigation, a grating of high dispersive power was combined with the radiomicrometer, which was found to be more reliable and of greater sensitiveness than the bolometer. Results are given for sodium, lithium, silver and calcium lines.

On the Distribution in Latitude of Solar Phenomena Observed at the Royal Observatory of the Roman College in 1894: P. TACCHINI.

The faculæ and spots of 1894, and especially the prominences, have been markedly more frequent in the southern hemisphere, like similar phenomena since the summer of 1892.

A Review of the Spectroscopic Observations of Mars. W. W. CAMPBELL.

The writer replies to some critics of his former paper on the spectrum of Mars, and makes a critical examination of previous work along this line. He concludes that many of the former observations were made under circumstances extremely unfavorable, and that between the different sets of results there is not a satisfactory close agreement.

Preliminary Table of Solar Spectrum Wave-Lengths. VI. H. A. ROWLAND.

The table is continued from λ 4674.648 to λ 4903.502.

On the Electromagnetic Nature of the Solar Radiation and on a New Determination of the Temperature of the Sun. H. EBERT.

A comparison of the form of the solar energy curve with that of a strongly damped electric oscillator shows that in sunlight we are dealing with electromagnetic vibrations. But with respect to electromagnetic radiation the principal mass of the Sun acts like a black body. Hence, applying Rubens' formula for the maximum energy of the radiation of blackened bodies, $\lambda \sqrt{T} = 123$, and using 0.6 μ for the value of λ as found by Langley for the maximum energy of the solar spectrum, a temperature of 40,000° C. is found for the more interior regions of the Sun. This is in good agreement with values previously determined by other methods.

Photographs of the Milky-Way near 15 Monoceros and near ε Cygni: E. E. BARNARD.

On the Limit of Visibility of Fine Lines in a Telescope: ALBERT A. MICHELSON.

A theoretical discussion proves that a line subtending an angle of one-fiftieth of the limit of resolution may be distinctly seen. This is verified by experiment and applied to the 'canals' on Mars. Supposing them to be quite dark, and distinguishable by an objective of not less than eighteen inches aperture, their width is calculated to be about one mile.

Conditions affecting the Form of Lines in the Spectrum of Saturn: JAMES E. KEELER.

The effects of instrumental displacements are considered, limiting the question to the case where the slit is parallel to the major axis of the ring.

A displacement of the image at right angles to the slit gives a disproportionate exposure to the middle parts of the lines, but unless the displacement exceeds one-fourth the semi-axis minor, there is scarcely any change in direction produced. A drift in the direction of the slit broadens the

lines uniformly. In every case, displacements tend to make the spectra of the ansæ parallel to the undisplaced lines of the comparison spectrum.

MINOR CONTRIBUTIONS AND NOTES.

Notes on Schmidt's Theory of the Sun.
Note on the Yerkes Observatory.
On the Presence of Helium in Clévéite.
Note on the Huggins Method of Photographing the Solar Corona without an Eclipse.
On the Cause of Granulation of the Surface of the Sun.

The illustrations of special interest are the two plates accompanying Professor Barnard's article, and a photographic reproduction of a water-color sketch of the Yerkes Observatory as it will appear when finished.

THE AMERICAN NATURALIST.

THE number for June opens with an article by Professor E. H. Barbour, of the University of Nebraska, on *Dæmonelix*, or the 'Devil's Corkscrew,' described by him in 1892. It is a reply to Dr. Theodor Fuchs, who has argued that this curious fossil is the burrow of a Miocene rodent. Professor Barbour holds that this is impossible, owing to the fact that the 'Bad Lands,' in which the fossils occur, are not wind deposits but water deposits, and for other reasons that he adduces. Dr. T. H. Montgomery in an article *On Successive Protandric and Proterogynic Hermaphroditism in Animals*, with a bibliography of 48 titles, concludes that hermaphroditism has been evolved out of the female state in all proterogynic forms, but that in the care of protandric forms it has been superimposed on the male sex. Articles follow by Dr. Joseph F. James on *Sponges, Recent and Fossil*, and by Mr. V. L. Kellogg on *The Mouth Parts of Lepidoptera*, both articles being illustrated. Dr. James points out the wide distribution of sponges in time and space, and, quoting from Sollas similarities in apparently unrelated families, concludes that forms now supposed to be genetically related may have been of distinct origin. Mr. Kellogg argues that the commonly accepted view that the mouth parts of the Lepidoptera are of a type adapted for sucking and that mandibles are wanting or rudimentary is not true without qualification. More than half of the number is occupied with notes and reviews on the progress of the several natural sciences.

NEW BOOKS.

Leitfaden für Histiologische Untersuchungen. BERNHARD RAWITZ. Jena, Gustav Fischer. 1895. Pp. xiii+148. M. 3.

Pflanzen Physiologische Praktikum. W. DETMER. Jena, Gustav Fischer. 1895. Pp. xvi+456. M. 9.

Untersuchungen über die Stärkekörner. ARTHUR MAYER. Jena, Gustav Fischer. 1895. Pp. xvi+318. M. 20.

Ueber die Auslese in der Erdgeschichte. JOHANNES WALTHER. Jena, Gustav Fischer. 1895. Pp. 36. 80 Pt..

Die Emancipation in der Ehe. FELICIE EWART. Hamburg and Leipzig, Leopold Voss. 1895. Pp. 75. M. 1.

Chinook Texts. FRANZ BOAS. Washington. 1894. Pp. 278.

A Text-Book of Zoögeography. FRANK E. BEDDARD. Cambridge, University Press. New York, Macmillan & Co. 1895. Pp. 8+246. $1.60.

The Natural History of Aquatic Insects. L. C. MIALL. London and New York, Macmillan & Co. 1895. Pp. ix+395. $1.75.

Electricity up to Date. JOHN B. VERITY. London and New York, Frederick Warne & Co. 1893. xii+226. 75 cents.

Algebra for Beginners. By H. S. HALL and S. R. KNIGHT. Revised by Frank L. Sevenoak. New York, Macmillan & Co. 1895. Pp. viii+180. 60 cents.

Report of the Secretary of Agriculture. Washington, D. C. 1895. Pp. 220.